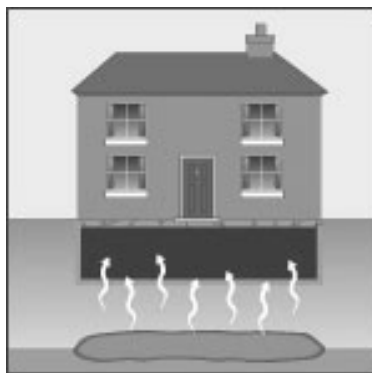




Vapor Intrusion Pathway: ITRC and States' Perspectives



John Boyer

New Jersey Department Of Environmental Protection

National Forum on Vapor Intrusion

12-13 January 2009

ITRC – Shaping the Future of Regulatory Acceptance



- Host organization
- Network



- State regulators
 - All 50 states and DC
- Federal partners



DOE



DOD



EPA

- ITRC Industry Affiliates Program



- Academia
- Community stakeholders

- Wide variety of topics
 - Technologies
 - Approaches
 - Contaminants
 - Sites
- Products
 - Documents
 - Technical and regulatory guidance documents
 - Technology overviews
 - Case studies
 - Training
 - Internet-based
 - Classroom

Vapor Intrusion



The migration of volatile chemicals from the subsurface into overlying buildings (USEPA 2002a)

Commercial/Industrial Worker

Working over Plume



Resident Living over Plume

Basement or Crawl Space



Without Basement



Indoor Air

Vadose Zone
Soil Gas

Soil and
Groundwater
Contamination

Historical Perspective



The Missing Pathway Period

The National VI Discussion Period

MA DEP
Hillside
School
Investigation

**J&E
Model**
published

NJDEP
IA Sampling
Guide for
VOCs

USEPA
includes VI
in EI
Determination

CO DPHE
Redfields,
CDOT
Sites

USEPA
holds DC
Vapor
Summit

USEPA
Subsurface
Vapor
Intrusion
Guidance

ASTM
VI
Standard

ITRC
VI Practical
Guideline

ITRC
VI Scenario
Document

1989

1991

1998

1999

2000

2002

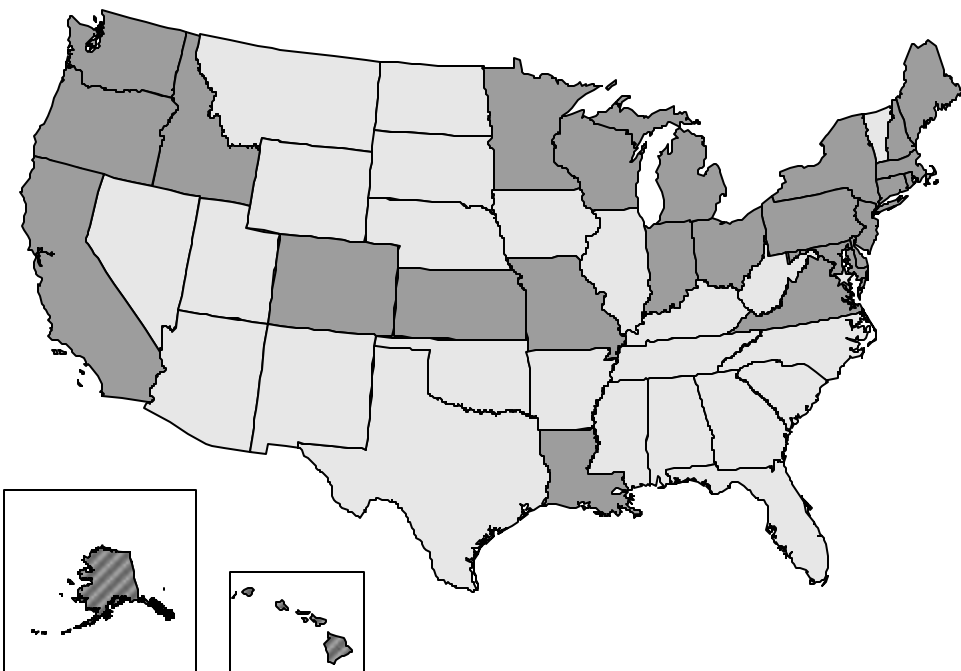
2007

2008

VI Regulatory State Guidance



States with Regulatory VI Guidance in 2004

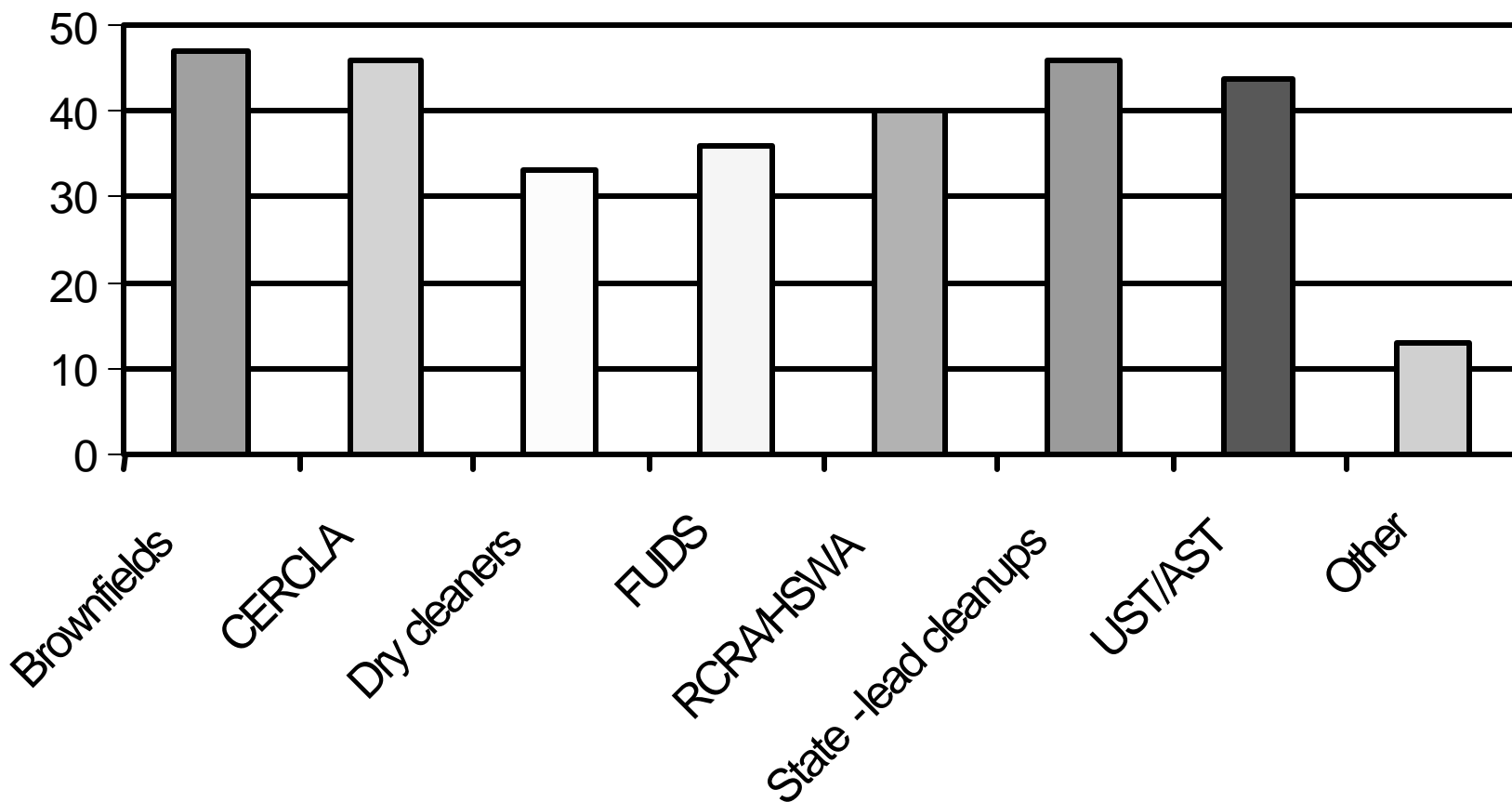


States with Regulatory Guidance in 2008

VI Impact on Regulatory Programs



54 Respondents Total



Magnitude of VI Cases – No Further Action (NFA)?



As of October 2007, only 6% of the responding states have re-opened a closed case due to the VI pathway



50% of the states have the authority to re-open a closed case based on site-specific information due to the VI pathway

Interdisciplinary Challenge



- Risk assessor
- Mechanical engineer
- Community relations coordinator
- Industrial hygienist
- Environmental scientist
- Soil scientist
- Hydrogeologist
- Analytical chemist
- Legal professional
- Real estate agents
- Banks
- Insurance agents



Attenuation (Alpha) Factors

$$\alpha_{sg} = C_{\text{indoor}}/C_{sg}$$

$$\alpha_{gw} = C_{\text{indoor}}/(C_{gw} * H)$$

Lower alpha means higher attenuation

Variation in current regulatory VI guidance:

EPA $\alpha_{sg} = 0.1$ for sub-slab

CA $\alpha_{sg} = 0.01$ for sub-slab

NJ $\alpha_{sg} = 0.02$ for sub-slab

NH $\alpha_{sg} = 0.02$ for sub-slab

PA $\alpha_{sg} = 0.01$ for sub-slab



Biodegradation



Biodegradable Petroleum Hydrocarbon Volatile Chemicals of Concern (PH-VCoC) are

“petroleum hydrocarbons such as benzene, xylenes, toluene and ethylbenzene (or a mixture of such chemicals) that are a subset of volatile chemicals of concern and that are distinguished because they are known to readily biodegrade to carbon dioxide in the presence of oxygen by ubiquitous soil microbes.”

ASTM (American Society of Testing and Materials)

Factors Affecting Indoor Air Screening Levels



- ✓ Target Media / Scenario
- ✓ Exposure Receptor(s)
- ✓ Background Contamination
- ✓ Models verses Attenuation Factors
- ✓ Screening verses Action
- ✓ Modifying Factors
- ✓ Differences between Agency Programs

Refer to Appendix H in the
ITRC VI Practical Guideline

Selected VI Values - Benzene



Media	California	New Jersey	Michigan	Penn.
Groundwater (µg/L)	NA	15	5,600	3,500
Soil Gas (µg/m ³)	36	16	150	NA
Indoor Air (µg/m ³)	0.084	2	2.9	2.7

Source: Eklund, B. et. al.2007. "An Overview of State Approaches to Vapor Intrusion." *EM*, February 2007.

Selected VI Values - PCE



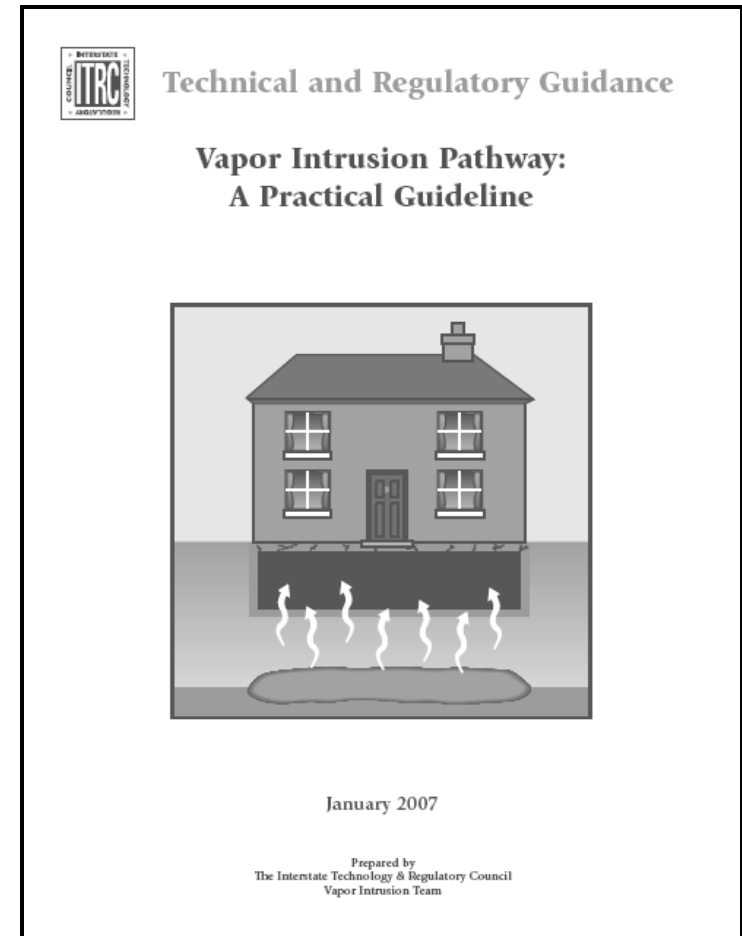
Media	California	New Jersey	Michigan	Penn.
Groundwater (µg/L)	NA	1	25,000	42,000
Soil Gas (µg/m ³)	180	34	2,100	NA
Indoor Air (µg/m ³)	0.41	3	42	36

Source: Eklund, B. et. al.2007. "An Overview of State Approaches to Vapor Intrusion." *EM*, February 2007.

ITRC Vapor Intrusion Pathway: A Practical Guideline



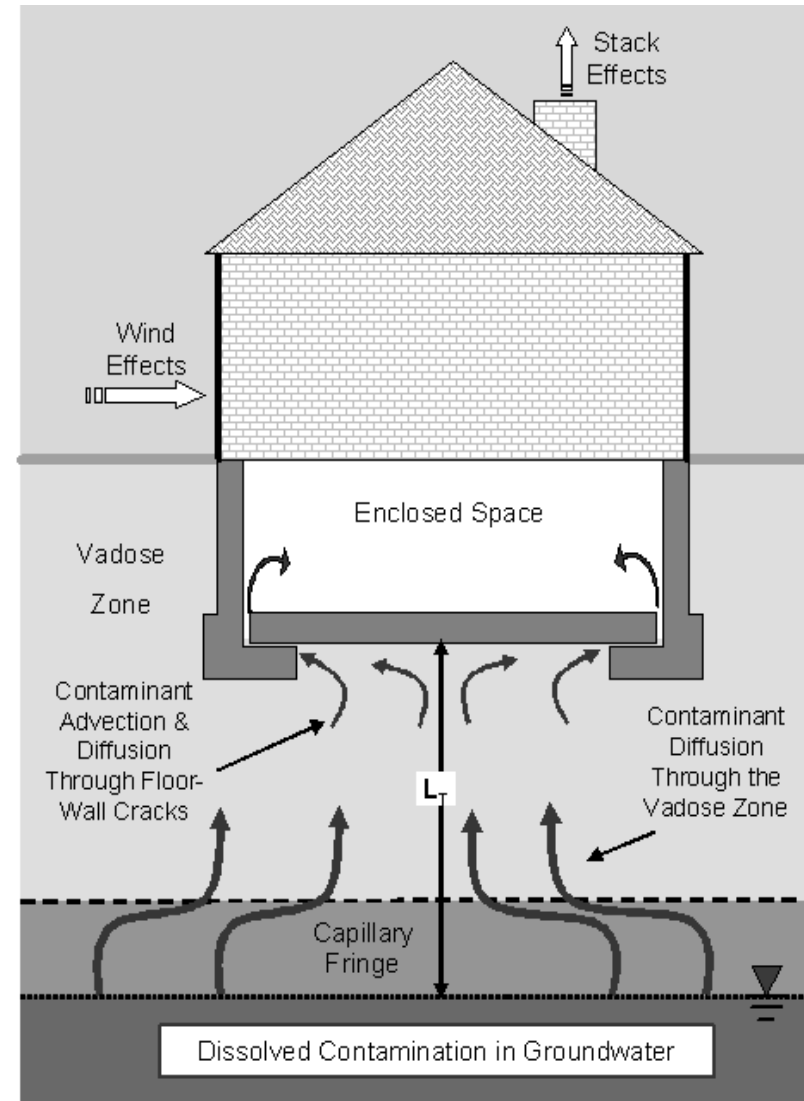
- Key vapor intrusion issues
 - Investigative strategies
 - Phased, iterative process
 - Background contamination
 - The “toolbox”
 - Conceptual site model
 - Future land use
 - Remediation technologies
 - Closure strategies
 - Qualified consultants



Multiple Lines of Evidence (MLE)



- Soil gas spatial concentrations
- Groundwater spatial data
- Background (internal and external / ambient) sources
- Building construction and current condition
- Sub-slab soil gas data
- Soil gas data
- Indoor air data
- Constituent ratios
- Soil stratigraphy
- Temporal patterns



Community Outreach



- Sensitive topic in community
- Strong community outreach helps inform and prepare
- Working with community groups
- Communication strategies



Refer to Appendix A,
“Community Stakeholder
Concerns” in the ITRC VI
Practical Guideline

ITRC VI Classroom Training



ITRC is offering 2-Day classroom training on the VI pathway that will include:

- Interactive Presentations
- Hands-on Exhibits
- Informative Handouts
- Problem Sets



Next session:

Oklahoma City, OK
April 6-7, 2009

